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基于居民生计的生态补偿研究  
——以西岛珊瑚礁自然保护区为例

Livelihoods-based Ecological Compensation: A Case Study  
of Xidao Coral Reef Reserve

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# 目 录

摘要.....	I
Abstract.....	III
第 1 章 绪 论 .....	1
1.1 研究背景 .....	1
1.2 国内外研究进展 .....	2
1.2.1 生态系统服务.....	2
1.2.2 居民生计.....	8
1.2.3 生态系统服务与居民生计.....	11
1.2.4 存在问题.....	16
1.3 研究目标和内容 .....	16
1.3.1 研究目标.....	16
1.3.2 研究内容.....	16
1.4 研究方法和技术路线 .....	17
第 2 章 生态系统服务与居民生计分析框架 .....	19
2.1 生态系统及其服务 .....	19
2.1.1 生态系统服务及其分类.....	19
2.1.2 生物多样性与生态系统服务.....	21
2.2 居民生计关键要素 .....	22
2.2.1 良好居民生计的关键要素.....	23
2.2.2 居民生计的分析框架.....	24
2.3 生态系统服务与居民生计的关系 .....	26
2.3.1 生态系统服务对居民生计的影响.....	26
2.3.2 生态系统服务与贫困的关系.....	29
2.3.3 人类活动对生态系统服务的影响.....	30
2.4 可持续性与居民生计 .....	32
2.5 当代与后代优先发展权的平衡 .....	33
第 3 章 西岛珊瑚礁自然保护区建立对居民生计的影响 .....	35
3.1 研究区域概况 .....	35
3.1.1 自然地理概况.....	35
3.1.2 社会经济概况.....	36
3.2 保护区建立前后生态系统变化 .....	37
3.3 西岛居民生计变化分析 .....	39
3.3.1 居民生计分析指标.....	39
3.3.2 保护区建立前后居民生计的变化.....	42
第 4 章 西岛珊瑚礁自然保护区生态系统服务价值评估 .....	58
4.1 西岛珊瑚礁自然保护区生物多样性价值评估 .....	59

4.1.1 评估方法.....	59
4.1.2 调查概况.....	59
4.1.3 结果与分析.....	59
4.2 西岛珊瑚礁自然保护区游憩价值评估 .....	64
4.2.1 TCM 理论基础.....	65
4.2.2 基本模型.....	65
4.2.3 西岛珊瑚礁生态系统游憩价值.....	66
4.3 西岛珊瑚礁生态系统服务总价值 .....	70
<b>第 5 章 西岛珊瑚礁保护区生态补偿标准和机制 .....</b>	<b>71</b>
5.1 生态补偿标准 .....	71
5.1.1 西岛居民损失的机会成本.....	71
5.1.2 基于自然资源租金的生态补偿标准.....	72
5.2 构建保护西岛珊瑚礁生态系统与改善西岛居民生计的机制 .....	73
5.2.1 主客体分析.....	74
5.2.2 补偿方式.....	77
5.2.3 保障体系.....	82
5.3 政策建议 .....	84
<b>第 6 章 结论和展望 .....</b>	<b>85</b>
6.1 论文总结 .....	85
6.1.1 主要结论.....	85
6.1.2 创新点.....	87
6.2 论文的不足和展望 .....	87
参考文献 .....	89
附件.....	96
研究生期间研究成果 .....	105
致谢.....	106



## Contents

Abstract (in Chinese) .....	I
Abstract (in English).....	III
Chapter 1 Introduction .....	1
1.1 Background .....	1
1.2 Literature Review .....	2
1.2.1 Ecosystem Services.....	2
1.2.2 Livelihoods .....	8
1.2.3 Ecosystem Service and Livelihoods .....	11
1.2.4 Existing Problems .....	16
1.3 Research Objectives and Contents.....	16
1.3.1 Research Objectives and Contents.....	16
1.3.2 Research Contents.....	16
1.4 Research Methods and Technical Route .....	17
Chapter 2 Ecosystem Service and Framework of Livelihoods .....	19
Chapter 2 Ecosystem Service and Framework of Livelihoods.....	19
2.1.1 Ecosystem Service and Its Categories .....	19
2.1.2 Biodiversity and Ecosystem Services .....	21
2.2 Key Components of Livelihoods .....	22
2.2.1 Key Components of Well Livelihoods.....	23
2.2.2 Framework of Livelihoods.....	24
2.3 Linkages between Ecosystem Service and Livelihoods .....	26
2.3.1 Impact of Ecosystem Service on Livelihoods.....	26
2.3.2 Ecosystem Service and Poverty .....	29
2.3.3 Impact of Ecosystem Service on Human Activities.....	30
2.4 Sustainability and Livelihoods.....	32
2.5 Balancing Priorities: Present Versus Future.....	33
Chapter 3 Impacts of Livelihoods on Establishment of Xidao Coral Reef Reserve.....	35
3.1 Introduction of the Research Area .....	35
3.1.1 Overview of Geography.....	35
3.1.2 Overview of Society and Economy .....	36
3.2 Change of Ecosystem Service after Establishment of Reserve .....	37
3.3 Change of Livelihoods of Xidao.....	39
3.3.1 Livelihoods Indicators .....	39
3.3.2 Change of Livelihoods after Establishment of Reserve.....	42
Chapter 4 Ecosystem Service Evaluation of Xidao Coral Reef Reserve .....	58

4.1 Biological Diversity Evaluation of Xidao Coral Reef Reserve .....	59
4.1.1 Evaluation Method .....	59
4.1.2 Overview of Research .....	59
4.1.3 Results and Analysis .....	59
4.2 Recreation Evaluation of Xidao Coral Reef Reserve .....	64
4.2.1 Basic Theory of TCM .....	65
4.2.2 Basic Model .....	65
4.2.3 Recreation Value of Xidao Coral Reef Reserve .....	66
4.3 Total Value of Xidao Coral Reef Reserve .....	70
Chapter 5 Ecological Compensation Standard and Mechanism of Xidao Coral Reef Reserve .....	71
5.1 Ecological Compensation Standard .....	71
5.1.1 Loss of Opportunity Cost .....	71
5.1.2 Ecological Compensation Standard Based on Natural Resource Rent .....	72
5.2 Mechanism of Xidao Ecosystem Protection and Livelihoods Improvements .....	73
5.2.1 Subject and Object .....	74
5.2.2 Means of Compensation .....	77
5.2.3 Security System .....	82
5.3 Recommendations .....	84
Chapter 6 Conclusions and Prospects .....	85
6.1 Conclusions .....	85
6.1.1 Main Conclusions .....	85
6.1.2 Innovation .....	87
6.2 Prospects .....	87
References .....	89
Appendixes .....	96
Publications .....	105
Acknowledgements .....	106

## 摘要

生态系统是地球生命支持系统的核心组成部分,它为人类提供了各种产品和服务。健康的生态系统是人类赖以生存和居民生计改善的基础。然而,随着经济的高速发展,人类的过度开发利用使得生态系统严重退化,最终导致居民生计的恶化。如何在保护生态系统的同时改善当地居民的生计是国内外学术界和管理界研究的热点问题。本论文以海南省三亚西岛珊瑚礁自然保护区为研究区域,建立了生态系统服务与居民生计之间关系的研究框架;利用建立的框架分析西岛自然保护区建立对西岛居民生计的影响;论文在评估自然保护区经济价值的基础上,建立了保护区生态补偿标准的估算模型,探讨了保护西岛珊瑚礁生态系统与改善当地居民生计的机制。主要研究结果如下:

1) 论文利用生态经济学、社会学的理论和方法,建立了生态系统与居民生计关系研究框架。该框架包括了生态系统服务模块和居民生计模块。研究显示,生态系统服务对构成居民生计的各个要素,包括物质、健康、安全以及社会关系以及保证这些生计的经济来源——收入,都有重要的影响。生态系统服务状况是影响大多数贫困人口生计问题的一个主导因素。良好的生态系统是可持续居民生计的关键。

2) 论文利用建立的研究框架,分析了保护区建立后西岛居民的生计变化情况。保护区建立后,西岛居民物质条件、健康、安全以及社会关系等四方面生计状况得到了一定程度的改善,但是维持生计的经济来源——收入却出现恶化。虽然与建立保护区前相比,西岛居民户均纯收入增长 1887 元,但其总体收入仍低于三亚市的平均水平。户均收入的增长率(19.6%)远远落后于三亚市农村家庭纯收入的增长率(170.7%)。主要原因是西岛居民被禁止在保护区海域内捕鱼,直接致使其每年渔业收入户均减少 17264 元。总体而言,虽然西岛居民的生计状况略有改善,但参照当地社会经济的发展水平以及大幅增加的西岛旅游收入,居民生计状况实际处于恶化状况。

3) 论文评估了西岛珊瑚礁生态系统服务价值。(1) 论文采用或然价值法评估西岛珊瑚礁生物多样性价值,得到居民对西岛珊瑚礁生态系统服务的支付意愿为 46.4 元/年·人。最终计算得出西岛珊瑚礁生态系统生物多样性价值为 7053.26 万元;(2) 采用旅行费用法评估西岛珊瑚礁游憩价值。研究得到西岛游客出游率

与旅行费用回归方程： $V=188.103-121756.223/TC$ ，根据拟合的回归方程式，推算出游客对西岛的旅游需求曲线，从而求得西岛珊瑚礁生态系统游憩价值为 17106.51 万元。西岛珊瑚礁生态系统的总价值为两者之和，为 24159.77 万元。

4) 论文建立了基于自然资源租金的保护区生态补偿标准的估算方法，并对西岛保护区生态补偿标准进行了估算。人均生态补偿标准以西岛居民对生态系统保护的贡献 5.35 万元为上限，以保护区建立导致的西岛居民机会成本损失 2081 元为下限，以珊瑚礁生态系统作为自然资源的租金为基础，得到人均生态补偿标准为 6825 元/年；

5) 论文探索了同时促进生态系统保护与居民生计改善的机制。根据西岛保护区的实际情况、旅游开发现状以及西岛居民的受偿意愿，论文提出了分阶段补偿方案：现阶段以现金补偿为主，以实物补偿、智力补偿以及政策补偿为辅，在西岛居民生计水平改善到一定程度时，则改以智力补偿和政策补偿为主，现金补偿和实物补偿为辅。论文还提出了包括推进西岛珊瑚礁自然保护区补偿制度建设、改革西岛旅游开发秩序及建立生态环境、旅游开发、居民生计三位一体的发展模式等政策建议。

**关键词：**生态系统服务；居民生计；生态补偿标准；珊瑚礁生态系统；西岛

## Abstract

Ecosystem is the core of life support system on earth, providing human beings with various products and services. A healthy ecosystem is fundamental to human survival and livelihoods improvement. However, with the rapid development of social economy, human's excessive exploitation and utilization exacerbates the degradation of ecosystem, which leads to worsening livelihood conditions. How to protect ecosystem, meanwhile, improve livelihoods of local people becomes a hot issue in both academic and managerial circle at home and abroad.

By designating Sanya Xidao coral reef natural reserve in Hainan province as the study area and establishing the research framework of ecosystem and its links to residents' livelihoods, this paper aims to analyze impacts of establishment of reserve on residents livelihoods and investigate mechanism of Xidao coral reef ecosystem protection and local residents' livelihoods improvement on the basis of evaluation of natural reserve's economic value and estimation model of reserve standard compensation. The main research results are as follows:

1) This paper used theory and method of ecological economics and sociology to build framework of ecosystem and its linkages to residents' livelihoods, which consists of ecosystem services module and livelihoods module. Researches show that ecosystem services have exerted great impacts on components of residents' livelihoods, including material, health, safety, social relationship as well as income, the financial source to guarantee these livelihoods. As ecosystem service is a dominating factor of the poor's livelihood in great majority, favorable ecosystem is essential to livelihoods sustainability.

2) This paper used established research frameworks to analyze changes of livelihoods after establishment of reserve. Residents' material conditions, health, safety as well as social relationships in Xidao have been improved to some extent after the construction of the reserve, except for source of finance, a guarantee of those livelihoods. Although the net income has increased by 1,887 yuan per household on average, the overall revenue is still lower than the average level in Sanya, compared

with the same period, the growth rate of 19.6% lags far behind the growth rate of 170.7% in net income of rural population. The main reason is the prevention of islanders from fishing within the reserve area, directly leading to the reduction of fishing revenue worth 17,264 yuan annually. In a word, in spite of the slight improvement of Xidao residents' livelihood, it is actually in the situation of exacerbation with the reference to local social and economic development and increasing tourism income.

3) This paper assessed value of Xidao coral reef ecosystem services. A. Contingent value method is used to assess the value of Xidao coral reef biodiversity, learning that the residents' willingness to pay is 46.4 yuan per capita annually. The value of Xidao coral reef biodiversity is as much as 70,532.6 thousand yuan. B. Travel cost method is used to calculate tourist rate and traveling expenses. Based on Xidao travel rate and travel expenses, the equation of is used to make the tourists' demand curve of Xidao and the general consumer surplus is as much as 171,065.1 thousand yuan, that is, the recreation of Xidao coral reef ecosystem is worth 171 million yuan. The total value of Xidao coral reef ecosystem is the sum of the two, with 241,597.7 thousand yuan.

4) This paper put forward estimation method of reserve eco-compensation standard and estimated the amount of compensation. The average eco-compensation standard makes 53.5 thousand yuan, the amount of Xidao residents' contribution to ecosystem protection, as the upper limit, and 2,081 yuan, the amount of opportunity cost of Xidao residents by reserve construction, as the lower limit. With reference to the rental of coral reef ecosystem as a natural resource, the average eco-compensation is 6,825 yuan each year.

5) This paper explored the mechanism for ecosystem protection as well as livelihoods improvement. On the basis of the actual situation of Xidao natural reserve, tourism development situation as well as the Xidao residents' willingness to pay, this paper put forward staging compensation plans: at present stage, the compensation packages is given priority to cash, with material compensation, intelligence compensation and policy compensation as complementary compensation packages.

As the livelihood on Xidao improves to a certain degree, the priority is given to intelligence compensation and policy compensation, with cash and material compensation as complementary compensation. Policy recommendations in this paper include development of compensation mechanism of Xidao natural reserve, Xidao tourism development reforms and new development model by taking ecological environment, tourism development and residents' livelihood into consideration.

**Key words:** Ecosystem service; Livelihoods; Compensation mechanism; Coral reef ecosystem; Xidao





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